

## Tenebrionid Beetles Feeding on Tissues of Witches' Broom

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Witches' broom is a disease symptom of woody plants, in which compact, dense clusters of numerous twigs and branches are formed. The shoot mass originates from one point, giving a broom- or bird-nest-like appearance (Fig. 1). Witches' brooms can be induced by various organisms, such as fungi, phytoplasmas, and mites, and are classified as a type of plant gall (MANI, 1964; YUKAWA & MASUDA, 1996). Plant galls are deformed plant tissues that are induced by physicochemical stimuli from diverse organisms (MANI, 1964; YUKAWA & MASUDA, 1996), and because galls are manipulated by gall-inducers to be more nutritious than normal plant tissues, various arthropods facultatively or obligately use them as food sources (HARTLEY & LAWTON, 1992; SUGIURA *et al.*, 2006). Although many gall-using species have been observed on diverse types of galls, those associated with witches' brooms have rarely been recorded. Here, we describe the feeding habit of a tenebrionid beetle species observed feeding on the tissues of witches' broom.

Field observations and samplings were conducted at the base of Mt. Takamado ( $34^{\circ}40'N$ ,  $135^{\circ}51'E$ , ca. 210 m above sea level), Nara City, Nara Prefecture, in central Japan on 17 April 2001. At this site, we found many ( $>30$ ) shoot masses of witches' broom on a shrub of the thorny elaeagnus, *Elaeagnus pungens* THUNB. (Elaeagnaceae) (Fig. 1), and we sampled 14 masses using pruning scissors. Masses were individually placed in zip-lock plastic bags, transported to the laboratory, and maintained under laboratory conditions. The sizes of shoot masses of witches' broom varied, but the average length and width were ca. 80 and 70 mm, respectively. Three days after sampling, three *Tarpela cordicollis* (MARSEUL) (Coleoptera, Tenebrionidae) adults appeared from two of the 14 shoot masses stored in plastic bags and fed on the tissues of the witches' broom. One-third of the volume of each shoot mass was consumed by the beetles within 1 week. In addition, an adult preying mantis, *Amantis nawai* (SHIRAKI) (Mantodea, Mantidae), a nymph of the issid planthopper, *Gergithus variabilis* (BUTLER) (Hemiptera, Issidae), three jumping spiders (Araenae, Salticidae), and an adult acarophagous ladybird beetle, *Stethorus japonicus* KAMIYA (Coleoptera, Coccinellidae) were found amongst the 14 shoot masses of witches' broom.

Witches' broom on *E. pungens* is reportedly caused by the gall mite (Acari, Eriophyidae, *Eriophyes* sp.; YAMASHITA *et al.*, 1980). This mite appears to induce witches' brooms in new shoots of the host plant in the spring, although its life cycle has not been examined. Because most of the tissues of witches' brooms were dead at the time of sampling, and appeared to have been formed during the preceding year, the observed *T. cordicollis* beetles can be classified as secondary users (*i.e.*, a successor) of the gall (sensu MANI, 1964). Similar to other galls, witches' brooms are likely to be more nutritious than normal plant tissues; thus, the tenebrionid beetles may be



Fig. 1. A shoot mass of witches' broom on the thorny elaeagnus, *Elaeagnus pungens*, Scale line: 10 mm.

using them as a food source. In addition, the structure of witches' broom may function as a shelter for the beetles. The life history of *T. cordicollis* remains to be examined, but because *T. cordicollis* and other congeneric species can be collected by beating shrub foliage, and are often observed walking on tree trunks at night in the spring, they are probably arboreal species. Therefore, witches' broom may provide a suitable microhabitat for this arboreal tenebrionid beetle.

### References

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